

CLAIMS

1. An electrolyte membrane comprising a siloxane-based polymer, wherein the siloxane-based polymer is obtained by vinyl polymerization of a silane compound having (meth)acrylate functional group or a hydrolysis product thereof and a (meth)acrylate compound having a phosphate group followed by siloxane crosslinking.
2. The electrolyte membrane according to claim 1, wherein said hydrolysis product is obtained by hydrolysis/polycondensation of a methylalkoxysilane and a (meth)acrylate compound having an alkoxysilyl group.
3. The electrolyte membrane according to claim 1, wherein said (meth)acrylate compound having a phosphate group is a compound represented by the following general formula (A):
- $$\begin{array}{c}
 \text{R}^1 \\
 | \\
 \text{CH}_2 = \text{C} \\
 | \\
 \text{O} = \text{C} - \text{O} - \left(\text{CH}_2 - \underset{\text{H}}{\overset{\text{R}^2}{\text{C}}} - \text{O} \right)_n - \underset{\text{OH}}{\overset{\text{O}}{\text{P}}} - \text{OH}
 \end{array} \quad (\text{A})$$
- wherein R^1 represents H or CH_3 ; R^2 represents H, CH_3 or CH_2Cl ; and n represents an integer from 1 to 10.
4. The electrolyte membrane according to claim 1, wherein the membrane is hardened with a hardening

agent or a siloxane crosslinking component.

5. A solid polymer fuel cell comprising an electrolyte membrane of a siloxane-based polymer according to claim 1.

- 5 6. A method for producing an electrolyte membrane comprising a phosphate-containing siloxane-based polymer, the method comprising the steps of:
- providing an silane compound having (meth)acrylate functional group, and a (meth)acrylate
- 10 compound having a phosphate group;
- carrying out hydrolysis-polymerization of the silane compound to form a siloxane polymer having (meth)acrylate functional groups;
- carrying out vinyl polymerization with the
- 15 siloxane polymer and the (meth)acrylate compound having a phosphate group to obtain a siloxane-based polymer;
- forming a membrane from the siloxane-based polymer; and
- 20 crosslinking the siloxane-based polymer.

7. A method for producing an electrolyte membrane comprising a phosphate-containing siloxane-based polymer, the method comprising the steps of:
- providing a silane compound having a
- 25 (meth)acrylate functional group, and a (meth)acrylate compound having a phosphate group;
- carrying out vinyl polymerization with the

silane compound and the (meth)acrylate compound
having a phosphate group to form a vinyl polymer
having a group derived from the silane compound;

carrying out hydrolysis-polymerization of the
5 silane compound-derived groups to obtain a phosphate-
containing siloxane-based polymer;

forming a membrane of the siloxane-based
polymer; and

crosslinking the siloxane-based polymer.